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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/598,321

07/09/2008

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DE 040063

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24737 7590 04/09/2009
PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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EXAMINER

PETKOVSEK, DANIEL

ART UNIT

PAPER NUMBER

2874

MAIL DATE

DELIVERY MODE

04/09/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

This office action is in response to the preliminary amendment filed August 24, 2006. In accordance with the preliminary amendment, claims 3-10 have been amended to conform to U.S. PTO practice.

Claims 1-10 are pending.

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The prior art documents submitted by Applicant in the Information Disclosure Statements filed on April 25, 2007, have been considered and made of record (note attached copy of forms PTO-1449).

Claim Objections

3. Claims 1, 2, 8, and 10 are objected to because of the following informalities: these claims lack a period to end the claim. Further regarding claim 4, this claim includes an extra "or mixtures thereof" at the end of the claim. Regarding claims 8 and 10, please remove any "dashes" (-) in the claim language. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph. Regarding sole independent claim 1, this claim includes a broad range followed by a narrow range. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered **indefinite**, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 1 recites the broad recitation "made essentially out of a halide glass", and the claim also recites "preferably a fluoride glass" which is the narrower statement of the range/limitation. Claims 2-10 are dependent from claim 1.

6. Regarding claims 8 and 9, these claims include the same "preferably selected" terms. This renders the claims indefinite (see above). Correction is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2874

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-10 are rejected under 35 U.S.C. 102(b) as being anticipated by “Upconverting Tm³⁺ doped Ba-Y-Yb-F thin film waveguides for visible and ultraviolet light sources” (NPL to Chwalek et al.).

Chwalek et al. teaches a waveguide structure for upconversion of IR wavelength laser radiation comprising a) at least one base substrate layer made essentially out of a moisture-stable mechanically- and/or temperature-stable material; b) at least one active layer made essentially out of a halide glass, preferably a fluoride glass located on the base substrate layer whereby the material of the at least one base substrate layer has a different composition from the material of the at least one active layer, which clearly, fully meets Applicant’s claimed structural limitations for sole pending claim 1.

Regarding claim 2, Chwalek et al. teaches whereby the efficacy of the waveguide structure is greater than or equal to 10% and less than or equal to 90%, the efficacy being defined as radiated and/or emitted power of usable radiation out of the waveguide structure *100 / IR - power absorbed in the waveguide structure and usable radiation being defined as upconverted light in red, green and/or blue

Regarding claim 3, Chwalek et al. teaches a waveguide structure whereby the thickness of the active layer is greater than 0 and less than 5 μm .

Regarding claim 4, Chwalek et al. teaches a waveguide whereby the active layer material is selected out of a group containing: - ZBLAN, consisting essentially of the components ZrF₄, BaF₂, LaF₃, AlF₃ and NaF, doped with one or more rare earth ions

Art Unit: 2874

from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the crystals LiLuF_4 , LiYF_4 , BaY_2Fs , SrF_2 , LaCl_3 , KPb_2Cl_5 , LaBr_3 doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the rare earth doped metal fluorides Ba-Ln-F and Ca-Ln-F , where Ln is one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof.

Regarding claim 5, Chwalek et al. teaches a waveguide whereby the base substrate layer material has a weakening temperature of $\sim 300^\circ\text{C}$ and $\sim 2000^\circ\text{C}$ and/or has a lower refractive index than the active layer material.

Regarding claim 6, Chwalek et al. teaches a waveguide whereby the base substrate layer material is selected out of a group comprising quartz glass, hard glass, MgF_2 and mixtures thereof.

Regarding claim 7, Chwalek et al. teaches a waveguide whereby the active layer is coated on the base substrate layer by hot dip spin coating.

Regarding claim 8, Chwalek et al. teaches a waveguide whereby a length of the active layer is greater than 100 μm and less than 100,000 μm , and/or a width of the active layer is greater than 1 μm and less than 200 μm .

Regarding claim 9, Chwalek et al. teaches a waveguide comprising a sealing layer located on the active layer in such a way, that the active layer is between the base substrate layer and the sealing layer, the sealing layer material being preferably selected out of a group comprising SiO_2 , higher index of refraction materials, preferably

Art Unit: 2874

A1203 and/or Si₃N₄, polymers, spin on glass or mixtures thereof, either alone or in combination with an optical isolation layer.

Regarding claim 10, Chwalek et al. teaches a waveguide being designed for the usage in one of the following applications: shop lighting, home lighting, accent lighting, spot lighting, theater lighting, automotive headlighting, fiber-optics applications, and projection systems.

9. Claims 1-10 are rejected under 35 U.S.C. 102(b) as being anticipated by NPL to Favre et al. "Fabrication and characterization....".

Favre et al. teaches a waveguide structure for upconversion of IR wavelength laser radiation comprising a) at least one base substrate layer made essentially out of a moisture-stable mechanically- and/or temperature-stable material; b) at least one active layer made essentially out of a halide glass, preferably a fluoride glass located on the base substrate layer whereby the material of the at least one base substrate layer has a different composition from the material of the at least one active layer, which clearly, fully meets Applicant's claimed structural limitations for sole pending claim 1.

Regarding claim 2, Favre et al. teaches whereby the efficacy of the waveguide structure is greater than or equal to 10% and less than or equal to 90%, the efficacy being defined as radiated and/or emitted power of usable radiation out of the waveguide structure *100 / IR - power absorbed in the waveguide structure and usable radiation being defined as upconverted light in red, green and/or blue

Regarding claim 3, Favre et al. teaches a waveguide structure whereby the thickness of the active layer is greater than 0 and less than 5 μm .

Regarding claim 4, Favre et al. teaches a waveguide whereby the active layer material is selected out of a group containing: - ZBLAN, consisting essentially of the components ZrF_4 , BaF_2 , LaF_3 , AlF_3 and NaF , doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the crystals LiLuF_4 , LiYF_4 , BaY_2Fs , SrF_2 , LaCl_3 , KPb_2Cl_5 , LaBr_3 doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the rare earth doped metal fluorides Ba-Ln-F and Ca-Ln-F , where Ln is one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof.

Regarding claim 5, Favre et al. teaches a waveguide whereby the base substrate layer material has a softening temperature of $\sim 300^\circ\text{C}$ and $\sim 2000^\circ\text{C}$ and/or has a lower refractive index than the active layer material.

Regarding claim 6, Favre et al. teaches a waveguide whereby the base substrate layer material is selected out of a group comprising quartz glass, hard glass, MgF_2 and mixtures thereof.

Regarding claim 7, Favre et al. teaches a waveguide whereby the active layer is coated on the base substrate layer by hot dip spin coating.

Regarding claim 8, Favre et al. teaches a waveguide whereby a length of the active layer is greater than 100 μm and less than 100,000 μm , and/or a width of the active layer is greater than 1 μm and less than 200 μm .

Regarding claim 9, Favre et al. teaches a waveguide comprising a sealing layer located on the active layer in such a way, that the active layer is between the base substrate layer and the sealing layer, the sealing layer material being preferably selected out of a group comprising SiO₂, higher index of refraction materials, preferably Al₂O₃ and/or Si₃N₄, polymers, spin on glass or mixtures thereof, either alone or in combination with an optical isolation layer.

Regarding claim 10, Favre et al. teaches a waveguide being designed for the usage in one of the following applications: shop lighting, home lighting, accent lighting, spot lighting, theater lighting, automotive headlighting, fiber-optics applications, and projection systems.

10. Claims 1-10 are rejected under 35 U.S.C. 102(b) as being anticipated by NPL to Harwood et al. "A 1317 neodymium doped fluoride.....".

Harwood et al. teaches a waveguide structure for upconversion of IR wavelength laser radiation comprising a) at least one base substrate layer made essentially out of a moisture-stable mechanically- and/or temperature-stable material; b) at least one active layer made essentially out of a halide glass, preferably a fluoride glass located on the base substrate layer whereby the material of the at least one base substrate layer has a different composition from the material of the at least one active layer, which clearly, fully meets Applicant's claimed structural limitations for sole pending claim 1.

Regarding claim 2, Harwood et al. teaches whereby the efficacy of the waveguide structure is greater than or equal to 10% and less than or equal to 90%, the

Art Unit: 2874

efficacy being defined as radiated and/or emitted power of usable radiation out of the waveguard structure $\times 100 / \text{IR}$ - power absorbed in the waveguide structure and usable radiation being defined as upconverted light in red, green and/or blue

Regarding claim 3, Harwood et al. teaches a waveguide structure whereby the thickness of the active layer is greater than 0 and less than 5 μm .

Regarding claim 4, Harwood et al. teaches a waveguide whereby the active layer material is selected out of a group containing: - ZBLAN, consisting essentially of the components ZrF_4 , BaF_2 , LaF_3 , AlF_3 and NaF , doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the crystals LiLuF_4 , LiYF_4 , BaY_2Fs , SrF_2 , LaCl_3 , KPb_2Cl_5 , LaBr_3 doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the rare earth doped metal fluorides Ba-Ln-F and Ca-Ln-F , where Ln is one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof.

Regarding claim 5, Harwood et al. teaches a waveguide whereby the base substrate layer material has a softening temperature of $\sim 300^\circ\text{C}$ and $\sim 2000^\circ\text{C}$ and/or has a lower refractive index than the active layer material.

Regarding claim 6, Harwood et al. teaches a waveguide whereby the base substrate layer material is selected out of a group comprising quartz glass, hard glass, MgF_2 and mixtures thereof.

Regarding claim 7, Harwood et al. teaches a waveguide whereby the active layer is coated on the base substrate layer by hot dip spin coating.

Regarding claim 8, Harwood et al. teaches a waveguide whereby a length of the active layer is greater than 100 μm and less than 100,000 μm , and/or a width of the active layer is greater than 1 μm and less than 200 μm .

Regarding claim 9, Harwood et al. teaches a waveguide comprising a sealing layer located on the active layer in such a way, that the active layer is between the base substrate layer and the sealing layer, the sealing layer material being preferably selected out of a group comprising SiO_2 , higher index of refraction materials, preferably Al_2O_3 and/or Si_3N_4 , polymers, spin on glass or mixtures thereof, either alone or in combination with an optical isolation layer.

Regarding claim 10, Harwood et al. teaches a waveguide being designed for the usage in one of the following applications: shop lighting, home lighting, accent lighting, spot lighting, theater lighting, automotive headlighting, fiber-optics applications, and projection systems.

11. Claims 1-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Paz-Pujalt et al. U.S.P. No. 5,492,776.

Paz-Pujalt et al. '776 teaches a waveguide structure for upconversion of IR wavelength laser radiation comprising a) at least one base substrate layer made essentially out of a moisture-stable mechanically- and/or temperature-stable material; b) at least one active layer made essentially out of a halide glass, preferably a fluoride glass located on the base substrate layer whereby the material of the at least one base substrate layer has a different composition from the material of the at least one active

Art Unit: 2874

layer, which clearly, fully meets Applicant's claimed structural limitations for sole pending claim 1.

Regarding claim 2, Paz-Pujalt et al. teaches whereby the efficacy of the waveguide structure is greater than or equal to 10% and less than or equal to 90%, the efficacy being defined as radiated and/or emitted power of usable radiation out of the waveguide structure $\times 100 / \text{IR - power absorbed in the waveguide structure and usable radiation being defined as upconverted light in red, green and/or blue}$

Regarding claim 3, Paz-Pujalt et al. teaches a waveguide structure whereby the thickness of the active layer is greater than 0 and less than 5 μm .

Regarding claim 4, Paz-Pujalt et al. teaches a waveguide whereby the active layer material is selected out of a group containing: - ZBLAN, consisting essentially of the components ZrF_4 , BaF_2 , LaF_3 , AlF_3 and NaF , doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the crystals LiLuF_4 , LiYF_4 , BaY_2Fs , SrF_2 , LaCl_3 , KPb_2Cl_5 , LaBr_3 doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the rare earth doped metal fluorides Ba-Ln-F and Ca-Ln-F , where Ln is one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof.

Regarding claim 5, Paz-Pujalt et al. teaches a waveguide whereby the base substrate layer material has a softening temperature of $\sim 300^\circ\text{C}$ and $\sim 2000^\circ\text{C}$ and/or has a lower refractive index than the active layer material.

Regarding claim 6, Paz-Pujalt et al. teaches a waveguide whereby the base substrate layer material is selected out of a group comprising quartz glass, hard glass, MgF₂ and mixtures thereof.

Regarding claim 7, Paz-Pujalt et al. teaches a waveguide whereby the active layer is coated on the base substrate layer by hot dip spin coating.

Regarding claim 8, Paz-Pujalt et al. teaches a waveguide whereby a length of the active layer is greater than 100 μm and less than 100,000 μm , and/or a width of the active layer is greater than 1 μm and less than 200 μm .

Regarding claim 9, Paz-Pujalt et al. teaches a waveguide comprising a sealing layer located on the active layer in such a way, that the active layer is between the base substrate layer and the sealing layer, the sealing layer material being preferably selected out of a group comprising SiO₂, higher index of refraction materials, preferably Al₂O₃ and/or Si₃N₄, polymers, spin on glass or mixtures thereof, either alone or in combination with an optical isolation layer.

Regarding claim 10, Paz-Pujalt et al. teaches a waveguide being designed for the usage in one of the following applications: shop lighting, home lighting, accent lighting, spot lighting, theater lighting, automotive headlighting, fiber-optics applications, and projection systems.

12. Claims 1-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoh et al. U.S.P. No. 6,650,677 B1.

Itoh et al. '677 teaches a waveguide structure for upconversion of IR wavelength laser radiation comprising a) at least one base substrate layer made essentially out of a moisture-stable mechanically- and/or temperature-stable material; b) at least one active layer made essentially out of a halide glass, preferably a fluoride glass located on the base substrate layer whereby the material of the at least one base substrate layer has a different composition from the material of the at least one active layer, which clearly, fully meets Applicant's claimed structural limitations for sole pending claim 1.

Regarding claim 2, Itoh et al. teaches whereby the efficacy of the waveguide structure is greater than or equal to 10% and less than or equal to 90%, the efficacy being defined as radiated and/or emitted power of usable radiation out of the waveguard structure *100 / IR - power absorbed in the waveguide structure and usable radiation being defined as upconverted light in red, green and/or blue

Regarding claim 3, Itoh et al. teaches a waveguide structure whereby the thickness of the active layer is greater than 0 and less than 5 μm .

Regarding claim 4, Itoh et al. teaches a waveguide whereby the active layer material is selected out of a group containing: - ZBLAN, consisting essentially of the components ZrF_4 , BaF_2 , LaF_3 , AlF_3 and NaF , doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the crystals LiLuF_4 , LiYF_4 , BaY_2Fs , SrF_2 , LaCl_3 , KPb_2Cl_5 , LaBr_3 doped with one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof, - one or more of the rare earth doped metal fluorides Ba-Ln-F and Ca-Ln-F ,

Art Unit: 2874

where Ln is one or more rare earth ions from the group Er, Yb, Pr, Tm, Ho, Dy, Eu, Nd or a combination thereof.

Regarding claim 5, Itoh et al. teaches a waveguide whereby the base substrate layer material has a weakening temperature of $\sim 300^{\circ}\text{C}$ and $\sim 2000^{\circ}\text{C}$ and/or has a lower refractive index than the active layer material.

Regarding claim 6, Itoh et al. teaches a waveguide whereby the base substrate layer material is selected out of a group comprising quartz glass, hard glass, MgF_2 and mixtures thereof.

Regarding claim 7, Itoh et al. teaches a waveguide whereby the active layer is coated on the base substrate layer by hot dip spin coating.

Regarding claim 8, Itoh et al. teaches a waveguide whereby a length of the active layer is greater than 100 μm and less than 100,000 μm , and/or a width of the active layer is greater than 1 μm and less than 200 μm .

Regarding claim 9, Itoh et al. teaches a waveguide comprising a sealing layer located on the active layer in such a way, that the active layer is between the base substrate layer and the sealing layer, the sealing layer material being preferably selected out of a group comprising SiO_2 , higher index of refraction materials, preferably Al_2O_3 and/or Si_3N_4 , polymers, spin on glass or mixtures thereof, either alone or in combination with an optical isolation layer.

Regarding claim 10, Itoh et al. teaches a waveguide being designed for the usage in one of the following applications: shop lighting, home lighting, accent lighting,

Art Unit: 2874

spot lighting, theater lighting, automotive headlighting, fiber-optics applications, and projection systems.

13. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by NPL to Lousteau et al "Fluoride glass planar waveguide....".

Lousteau et al. teaches a waveguide structure for upconversion of IR wavelength laser radiation comprising a) at least one base substrate layer made essentially out of a moisture-stable mechanically- and/or temperature-stable material; b) at least one active layer made essentially out of a halide glass, preferably a fluoride glass located on the base substrate layer whereby the material of the at least one base substrate layer has a different composition from the material of the at least one active layer, which clearly, fully meets Applicant's claimed structural limitations for sole pending claim 1.

14. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by NPL to Fujihara et al. "Sol-gel processing.....".

Fujihara et al. teaches a waveguide structure for upconversion of IR wavelength laser radiation comprising a) at least one base substrate layer made essentially out of a moisture-stable mechanically- and/or temperature-stable material; b) at least one active layer made essentially out of a halide glass, preferably a fluoride glass located on the base substrate layer whereby the material of the at least one base substrate layer has a different composition from the material of the at least one active layer, which clearly, fully meets Applicant's claimed structural limitations for sole pending claim 1.

Inventorship

15. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: PTO-892 form references A-D.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL PETKOVSEK whose telephone number is (571) 272-4174. The examiner can normally be reached on M-F 8:30-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Uyen Chau Le can be reached on (571) 272-2397. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2874

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel Petkovsek/
Patent Examiner, Art Unit 2874
April 7, 2009